

PAGES

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The Canadian Engineer

A Weekly Paper for Civil Engineers and Contractors

Circular Concrete Reservoirs at Leamington, Ont.

Provide Storage of One Million Imperial Gallons, Which Will Supply Town for Several Days and Complies With Requirements of the Fire Underwriters—Low Unit Stress in Steel—Walls Entirely Separate from Floors

By EDWARD M. PROCTOR

James, Loudon & Hertzberg, Ltd., Consulting Engineers, Toronto

WATER for the town of Leamington, Ont., is obtained from springs situated about $1\frac{1}{4}$ miles from the pump house. The supply is carried through a gravity pipe line. As this supply is barely large enough to meet the demands made upon the system during the hot weather, some measures had to be taken to improve the facilities. Well-pumping was tried, but did not prove very successful, and as the fire underwriters were demanding a storage reservoir for fire purposes, it was decided to construct a reservoir to provide a storage capacity of one million gallons.

With a reservoir of this size it is possible to supply the town for several days without depending upon the supply

upon which the reservoir is built was finally bought. After removing several houses, construction was started.

The general layout of these reservoirs is shown by the accompanying plan. The tanks are 100 ft. in diameter and are located 116 ft. centre to centre.

The piping arrangement is rather novel, as it permits of either one of the basins being operated independently, or both being used in series. They are also so connected that they can be used independently of the old tanks. A study of the piping layout will show how this is possible. The sewer into which these tanks empty is a large concrete culvert section, which had been laid to take the flow of the



VIEW OF COMPLETED RESERVOIRS AT LEAMINGTON, ONT.

from the wells. Also, in the event of a big fire, ample water is available.

After deciding upon the necessity and the size of the reservoir, the question arose as to its location. The gravity head fixed the height to which the water could be raised in any reservoir, and the elevation of the sewer determined the maximum depth; thus the allowable depth of water was fixed at 9 ft. It was first planned to build this reservoir rectangular in shape, with a cross dividing wall, but upon preliminary designs and estimates being made, it was found that by constructing two circular reservoirs, considerable saving would be effected in the cost of construction. In order to adopt this type of construction, namely, two circular reservoirs instead of the rectangular, it was necessary to purchase considerably more land, but even with the added cost of land, the circular design still proved the most economical. After considering three or four different locations, the site

small stream which formerly flowed along the line of the present drain.

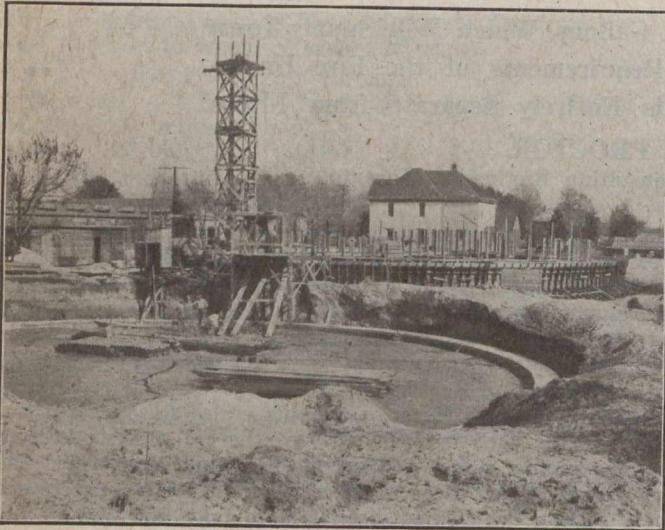
The design is shown by the accompanying drawings. Each tank consist of a floor, a circular wall, interior columns and a wooden roof. The columns are 12 by 12 ins., concrete, resting on a footing 24 by 24 ins., and each reinforced with four $\frac{1}{2}$ -in. steel rods. These columns are in two circles, the inner one 30 ft. in diameter and the outer one 18 ft. from the inner circle. The roof is of wood, treated with three coats of Barrett's "Carbosota Creosote" paint, and is carried by 2 x 12-in. rafters, bearing on pine timbers, which span from column to column. These spans are 15 to 17 ft. The centre portion of the roof above the louvre is carried by means of one wooden truss supporting a centre block 12 ins. in diameter, to which the joists connect. The louvre has a vertical opening of 18 ins., and is covered with wire screen to keep out birds and insects. Over the entire roof is a four-

ply tar and gravel cover. The roof has a slope of about 2 ft. 9 ins. in 35 ft.

The floor of the reservoir is constructed in two courses, the lower course being 5½ ins. of concrete, reinforced both ways with ½-in. diameter rods at 12-in. centres. On top of this course was mopped two-ply of 8-oz. burlap, swabbed on with hot asphalt, all joints being lapped. Above this burlap course was laid a 3-in. course of concrete, reinforced both ways with ¼-in. rods at 5-in. centres. Around all columns a 1-in. asphalt joint was constructed, and between this 3-in. top layer of concrete and the wall, a 2-in. asphalt joint was made. The lower course was laid directly upon the soil. The

are supported on structural steel struts, built of two angles, 2½ by 2 by ¼ ins., connected by batten plates. These supports are placed at 8-ft. centres.

This circular wall bears on a footing 3 ft. in width, which is also circular. The rods in the lower course of the floor



FORMS IN PLACE FOR ONE RESERVOIR—FOOTING OF OTHER RESERVOIR POURED

6 ins. of gravel were omitted, the reason being that the soil was pure sand, making an excellent foundation.

As the ground water level was about 1 ft. above the level of the floor, and to avoid any possibility of hydrostatic thrust on the floor when the tanks are emptied, a system of drainage was installed. This consists of 4-in. field tile at 12-ft. centres, connecting into a main 5-in. tile under each tank. A 5-in. vitrified tile laid with open joints was laid around the complete circumference, and into this was connected the 4-in. cast-iron downspouts from the roof, which were eight in number for each basin.

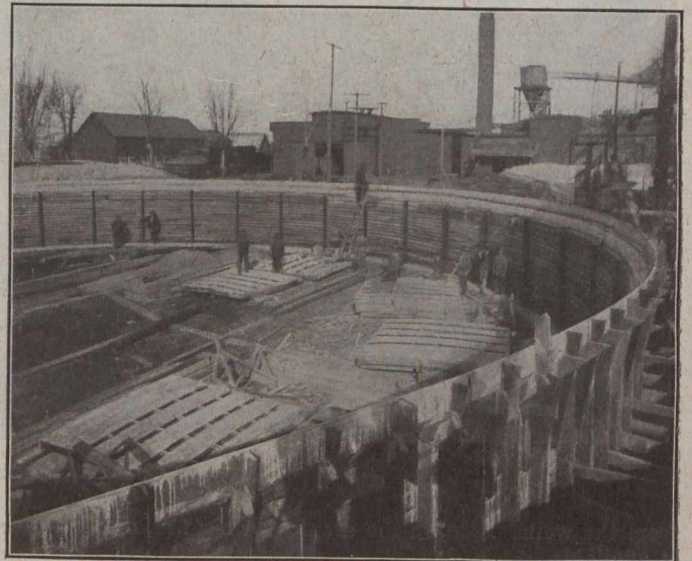
Perhaps the most interesting part of the design is the circular wall. This wall is 12 ins. thick and is reinforced circumferentially by means of the following rods: Twenty-two 1½-in. diameter, near the bottom, spaced from 4 to 6 ins. apart; then six 1-in. rods at 6-in. spacing; and the top course, fourteen ¾-in. rods at from 6 to 9-in. centres. These rods



POURING FLOOR FOR RESERVOIR

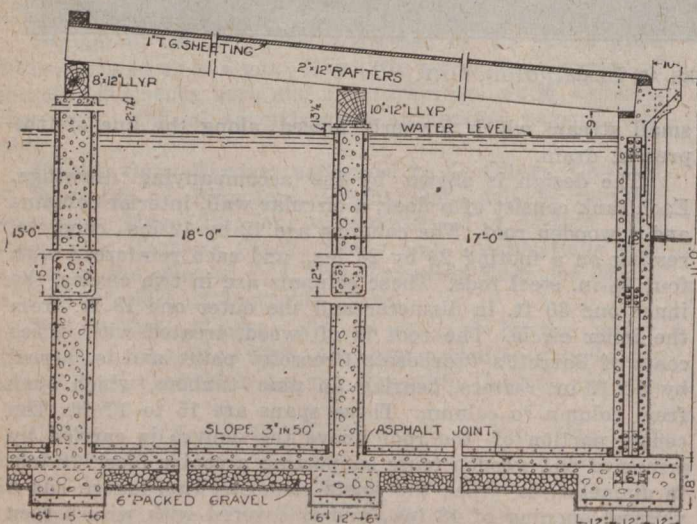
projected from this footing. The wall is corbelled out at the top to provide for a gutter.

This wall has no physical connection with the footing. The method of construction was as follows: The footing was first poured and finished with a trowelled surface, upon which was applied a coating of asphalt. The outer



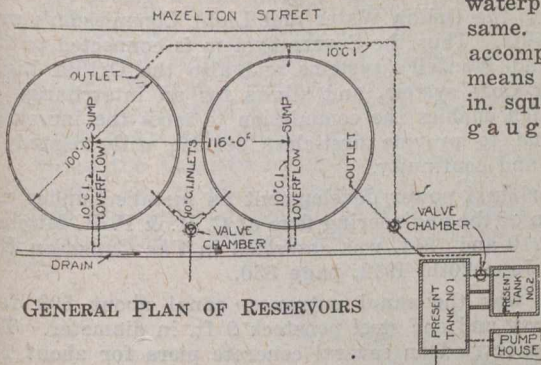
OUTSIDE FORMS AND REINFORCING IN PLACE—NOTE INSIDE FORMS READY FOR ERECTION

forms were erected, and then the reinforcing was placed, after which the inner forms were placed, and when all was in readiness the concrete for the entire wall was poured continuously. The steel takes up the entire circumferential stresses, the concrete being simply a covering for the steel and means of containing the water. By leaving the wall free at its base, expansion and contraction stresses are eliminated. In order to provide assurance that the concrete will not crack when subject to full stress, a unit stress in the steel of 4,000 lbs. per sq. in. was adopted. This unit stress is low enough that the resulting elongation in the steel will not crack the concrete.



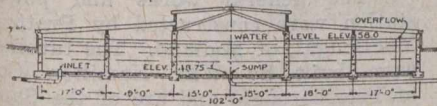
PART SECTION THROUGH RESERVOIR

In the accompanying drawings is shown the method that was used to bring the various inlet and outlet pipes through the floor and to waterproof around same. This was accomplished by means of a 36-in. square No. 20-gauge copper



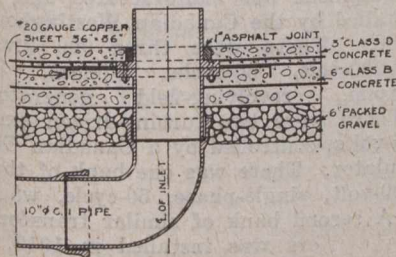
sheet, bolted between machine-flanged joints on the pipe. A 1-in. asphalt joint was made around each pipe. These joints were found to be very satisfactory and have been absolutely water-tight.

Considerable study was given to this design to secure an appearance that would be as pleasing as possible. This was necessary because these tanks are in the centre of the residential section of the town. After the premises have been



sodded, the tanks will look even more attractive than they do at present, the white concrete making a rather pleasing contrast with the green grass.

The concrete used on this work was as follows: For the walls, 1:1½:3; the lower 6-in. course of the floor, 1:2:4; footings and columns, 1:2:4.



SECTION THROUGH FLOOR SHOWING INLET PIPE

Reinforcing steel of a low grade was permitted on account of the low unit stress which was adopted.

The contract for this reservoir was let on the basis of cost plus \$2,800 for contractor's profit, and the total cost, including this profit, was \$41,415.20. This cost was made up of the following items:—

Labor	\$13,097.20
Reinforcing steel	5,846.08
Steel frames	750.44
C.I. pipe, specials, valves, etc.	3,814.49
Lumber, nails, etc.	6,033.34
Cement, sand, gravel and stone.	3,368.93
Burlap and pitch	589.59
Brick	143.24
Raising roofs of old tanks	750.00
Roof and supplies	1,377.82
Surety bond	204.60
Freight	2,185.66
Workmen's compensation	196.46
Miscellaneous	256.95
Contractor's profit	2,800.00
Total	\$41,415.20

The tenders were received in August, 1918. The contract was awarded August 23rd to the R. Wescott Co., of Windsor, Ont. Construction was started immediately, and basins were completed, ready for holding water, by the end of the year. The tenders ran all the way from \$41,920 (the Wescott Co.'s **guaranteed outside figure**) to \$77,000, which reflects the very unsettled conditions that prevailed in August, 1918. The engineer in charge was J. J. Newman, of Windsor, who is town engineer of Leamington. The plans and specifications were prepared by James, Loudon & Hertzberg, Ltd., consulting engineers, Toronto.

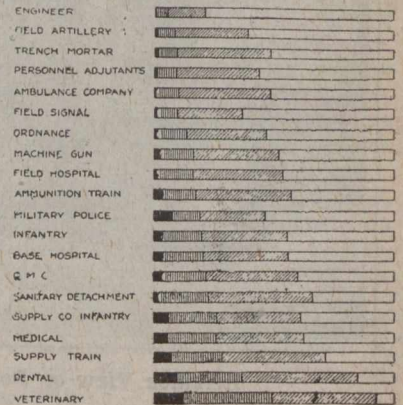
The reservoirs have been filled for nearly five months and have shown no leakage excepting at two or three small pin holes, which have been easily plugged, and now the reservoirs are absolutely water-tight.

ENGINEER OFFICERS FIRST IN MENTAL TESTS*

TYPICAL of the results obtained under the direction of the Division of Psychology, Medical Department of the United States War Department, is the chart reproduced herewith, which indicates that of all the classes of officers examined the engineer officers show the highest grade. The tests upon which the officers' ratings depend were prepared by a committee of the American Psychological Association and of the National Research Council, for the purpose of determining relative intelligence.

While admitting that a man's value to the service should not be judged by his intelligence alone, it has nevertheless been thoroughly demonstrated that the intelligence ratings are useful in indicating a man's probable value to the army service.

Letters ratings have been used as follows: A, very superior intelligence—this grade is ordinarily earned by only 4 or 5% of a draft quota, and is composed of men of marked intellectuality; B, superior intelligence—this class includes less exceptional intelligence than that in class A, and is obtained by 8 to 10 soldiers out of 100; C +, high average intelligence—this group includes 15 to 18% of all soldiers and contains a large amount of non-commissioned-officer material; C, average intelligence—includes about 25% of all soldiers; C -. low average intelligence—includes about 20% who, though below the average in intelligence, are usually good privates and satisfactory in work of routine nature; D, inferior intelligence—includes about 15%; and D - and E, very inferior intelligence. The comparison in the diagram is for officers only.



*From "Engineering News-Record," New York.

The Peterborough Council have not yet signed the contract with the Russell-Townsend Co., Toronto, for the construction of the Hunter St. bridge, although the Board of Works recommended the acceptance of that company's proposal to do the work on a cost-plus basis. The company estimated the cost at about \$249,000 and wanted about \$30,000 as a profit fee, this fee to include certain machinery rental. D. Conroy, of Peterborough, wrote a letter to the council, after the tenders had been announced, offering to do the work for a guaranteed sum of about \$243,000, and the council are considering the acceptance of his offer.

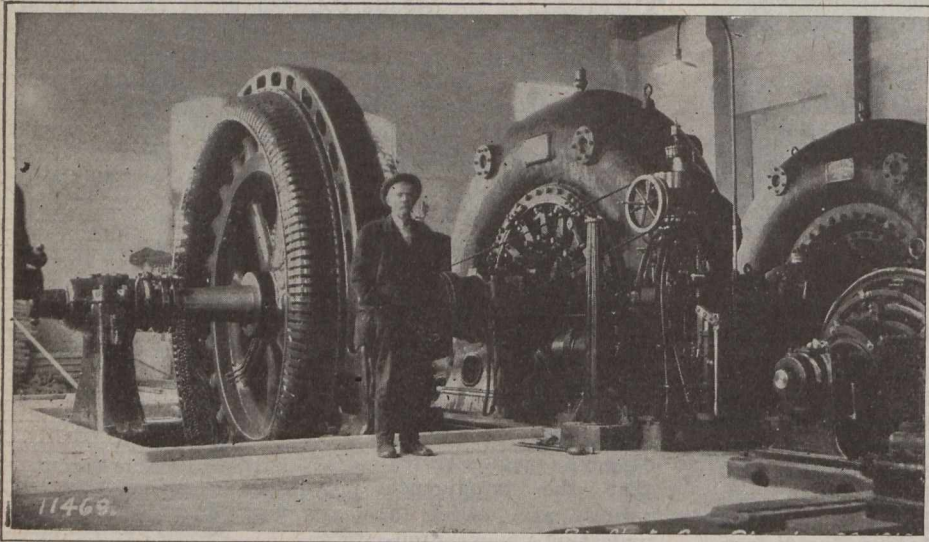
BIG CHUTE GENERATING STATION

By W. L. AMOS

Assistant Engineer, Hydro-Electric Power Commission of Ontario

IN the fall of 1909, the Simcoe Railway and Power Co., commenced a development on the Severn River at Big Chute, which is situated about nine miles from the point where the Severn River empties into Georgian Bay (see accompanying map). By May, 1911, three 900 h.p. units were installed ready for operation. The Simcoe Railway and Power Co. transmitted power at 22,000 volts to their substation at Midland. From this station it was distributed at 2,300 volts to the municipality of Midland. This company also proposed to distribute power to any place in the Simcoe County and Muskoka District.

In 1911, the Hydro-Electric Power Commission of Ontario contracted to take power from the Simcoe Railway



INTERIOR VIEW OF POWER HOUSE, SHOWING UNIT No. 4

and Power Co., and in May, 1911, power was delivered to Midland, and in November to Penetang.

In October, 1911, the load on this Big Chute generating station was 350 h.p.; in September, 1912, 550 h.p. In 1913 the number of municipalities supplied by the commission increased from two to seven; besides Midland and Penetang, there were Collingwood, Barrie, Coldwater, Elmvale and Stayner. The demand in October, 1913, was 1,233 h.p.

Up to 1914 the Simcoe Railway and Power Co. owned the Big Chute generating station, the transmission lines to Midland and the Midland station, also a station and distribution system in Victoria Harbor, whereas the Hydro-Electric Power Commission owned the remaining transmission lines and stations. In 1914 the Hydro-Electric Power Commission purchased the Simcoe Railway and Power Co., and first operated same on July 1st.

In 1915 Waubausene and Port McNicoll distributing stations were installed and fed from this system. In 1916 Port McNicoll (Canadian Pacific Railway) and Camp Borden stations were added. In 1918 Alliston, Beeton, Bradford, Cookstown, Thornton and Tottenham were included in the municipalities fed from this system. In December, 1918, the power demand on this Severn system was 6,350 h.p.; of which 3,700 h.p. was supplied by the Big Chute station and the remaining 2,700 h.p. was supplied by Eugenia and Wasdell's systems.

In 1912 a 22,000-volt transmission line was installed by the Orillia Light and Power Co. between Big Chute generating station and their Ragged Rapids generating station, for interchange of power. This tie line has since been purchased by the commission and connected to the Swift Rapids

generating station, which replaced the Ragged Rapids station. In 1917 the Severn system 22,000-volt transmission lines were connected to Eugenia system at Collingwood station. The Wasdell's Falls system has a 22,000-volt line connected to the Orillia Water and Light Commission's system at Orillia. Thus the Severn system is connected to the Eugenia and Wasdell's systems and also the Orillia Light and Power Co.'s system, and allows for an interchange of power, which enables the commission to meet the increased demand and to provide first-class service with regard to character and continuity.

The original power development as installed under the supervision of the engineering firm of C. H. & P. H. Mitchell in 1909, 1910 and 1911, was described in *The Canadian Engineer* for June 20th, 1912, page 830.

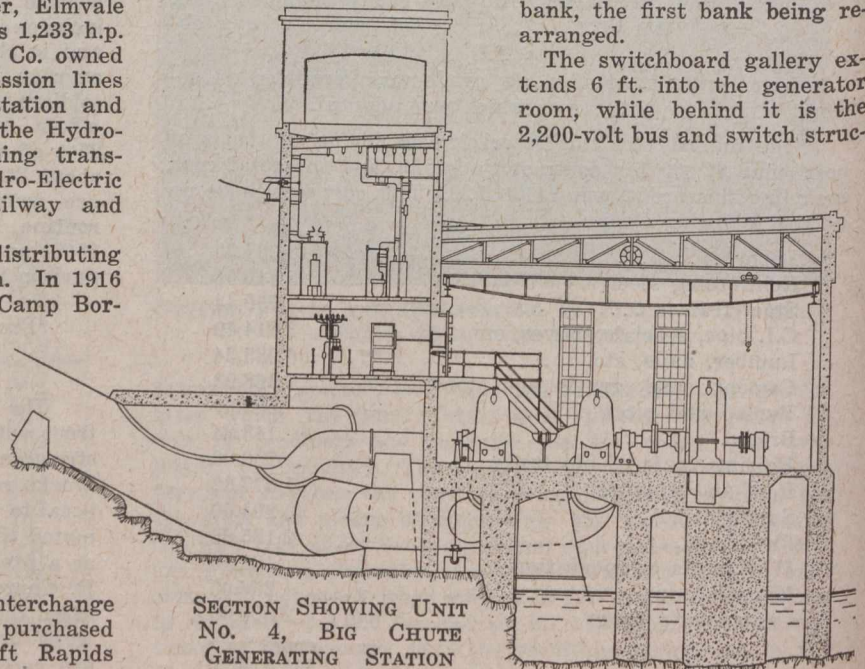
There was the canal entrance, canal about 500 feet long, forebay and one steel penstock 9 ft. in diameter. The penstock is carried on several concrete piers for about 150 ft. down the slope, and turns along the rear of the power house, terminating in a surge tank extending to an elevation 4 ft. above that maintained in the forebay. No. 1 and No. 2 turbines are connected with the penstock by diverging feeders and No. 3 is connected to the Y connection.

The general works and power station were constructed by Pratt & MacDougal, of Midland. The turbines were built by Wm. Hamilton Co., of Peterborough, and are of the Samson type, each designed for 1,300 h.p. capacity at 56 ft. head and at 300 r.p.m. The exciter turbines have a capacity of 200 h.p. under 56 ft. head at 580 r.p.m. The hydraulic turbine governors are all of the Lombard oil-pressure design.

Practically all the electrical equipment was manufactured and installed by the Canadian Westinghouse Co. There were three 900 k.v.a., 2,200-volt, 60-cycle, 3-phase, 300 r.p.m., revolving-field generators.

There were two turbine-driven exciters, each 100 k.w., 125-volts, controlled by a Canadian General Electric Co.'s regulator. There was one bank of three 600 k.v.a., 2,200-25,000-volt, single-phase, 60-cycle, water-cooled transformers. A second bank of similar transformers was installed in 1912, in the same pocket as No. 1 bank, the first bank being rearranged.

The switchboard gallery extends 6 ft. into the generator room, while behind it is the 2,200-volt bus and switch struc-



ture and generator rheostats, which are operated by shafts in a straight line between rheostat handle and the face plate on the rheostats.

Matchedash Bay is about 2,000 ft. across, and two spans were made, 1,153 ft. and 858 ft. respectively, in the 22,000-volt transmission lines between the generating station and Midland. The longer span also crosses the ship canal and necessitated a 175-ft. tower; the centre and east shore towers are each 88 ft. high.

When the Commission took over the Simcoe Railway and Power Co. in 1914, a number of minor changes were made in the metering equipment in Big Chute generating station to make it conform with the commission's requirements.

gether with two head-gate mechanisms, was awarded to the Boving Hydraulic & Engineering Co., of Lindsay. The extension is 38 by 60 by 30 ft. high over the generator room, and 40 ft. high over the transformer and high tension rooms.

The building will be reinforced concrete throughout, whereas in the original station the roof over the generator room consisted of wooden purlins, ¼-in. matched pine, and covered with several layers of asbestos felt, installed by the Johns-Manville Co. That part of the excavation and concrete work carried out in the fall of 1917, was done by Wells & Gray, of Toronto. This work was held up during the severe winter season of 1917 and 1918, and in the spring it was proceeded with by the Commission's Construction Department.

A 1,600 k.v.a., 300 r.p.m., 2,200-volt, 3-phase, 60-cycle, waterwheel type horizontal generator was purchased from the Canadian General Electric Co., who were also to deliver and erect it. A fly-wheel effect of 300,000 lbs. ft. squared was required in the rotor of this generator, and this necessitated a large diameter machine and was the reason for it being set so low in the foundations, as the generator shaft had to line up with the turbine shaft. The specifications for this generator permitted a minimum temperature rise of 40 degs. C., with a continuous load of 1,600 k.v.a., at 80% power factor, normal speed and voltage. This generator was tested in the factory at an overspeed of 185% normal speed for 15 minutes. An insulation test of 10,000 volts between the armature windings and frame was withstood for one minute. The field windings and the field rheostat resistances withstood 1,500 volts for one minute.

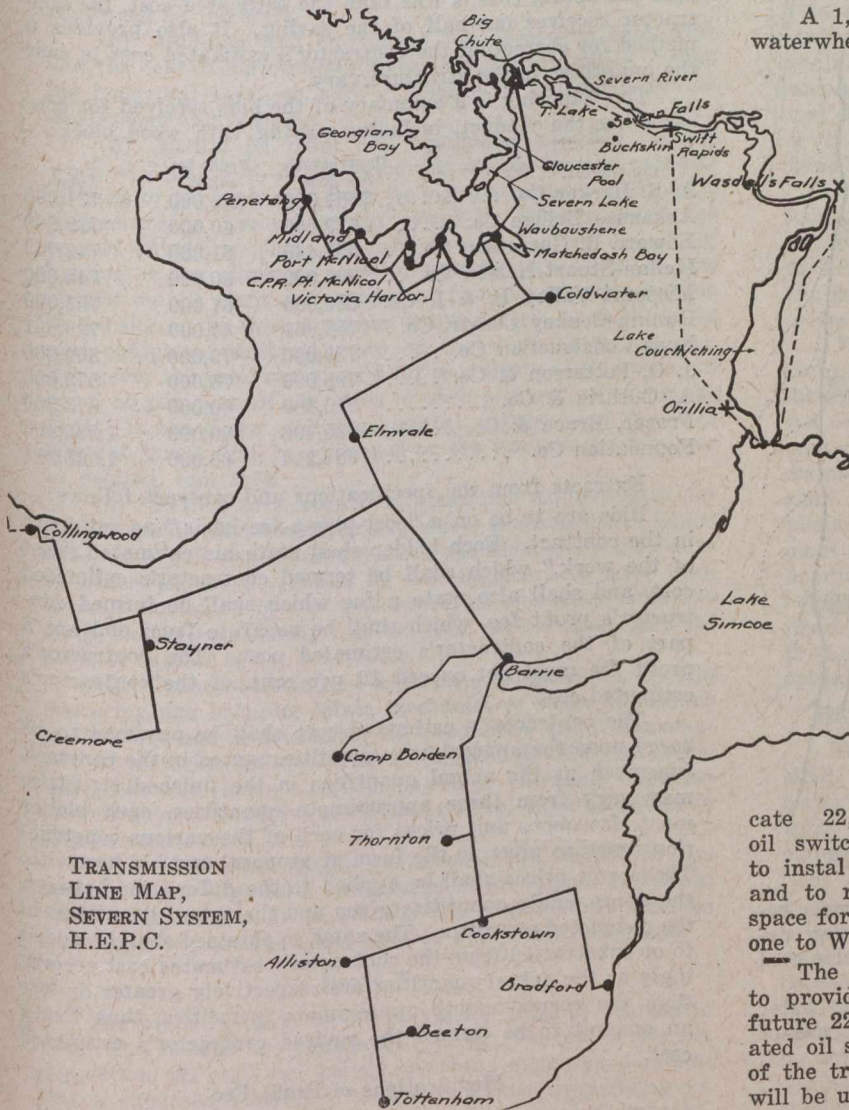
A heat run was made on this generator in the factory, also the necessary measurements were taken to calculate the efficiencies, regulation, etc. No tests were required after installation.

This fourth unit, together with the second penstock as mentioned above, were placed in service and power fed into the system on January 28th, 1919.

When making these extensions to the station, it was decided to remodel the high tension switching room by installing duplicate 22,000-volt busses and making all 22,000-volt oil switches electrically operated. It was also decided to instal equipment for one new 22,000-volt out-going line and to remodel the 22,000-volt arresters, and to provide space for equipment for two future lines, one to Orillia and one to Waubausene.

The present switchboard is to be rearranged in order to provide space for the panels to control the new and future 22,000-volt lines. New 2,200-volt, electrically-operated oil switches will be installed for the low tension sides of the transformers, and the present transformer switches will be used for the new generator and for station service transformers on the low tension side of each bank of transformers. A second set of disconnecting switches will be installed and the oil switch rearranged so that each bank can be connected to either bus, whereas at present each bank can be connected to only one bus. This extension includes a second transformer pocket, and one bank of transformers will be removed from No. 1 pocket to No. 2 pocket and the transformers in No. 1 pocket will be rearranged. Space is provided in No. 2 pocket for a possible future bank of transformers, also space for a machine shop and an oil storage tank.

A spare 600 k.v.a. transformer has been purchased from the Canadian Westinghouse Co., and will be delivered this summer. It will be brought up the river in a scow. This spare transformer will be installed in No. 1 pocket with permanent 22,000-volt connections and 2,200-volt connections carried to each transformer in No. 1 and No. 2 banks, so that with short temporary connections it can be



TRANSMISSION LINE MAP, SEVERN SYSTEM, H.E.P.C.

In 1917 some 2,200-volt equipment was installed to supply the Department of Railways of Canada with power and light for the marine railways installed at Big Chute.

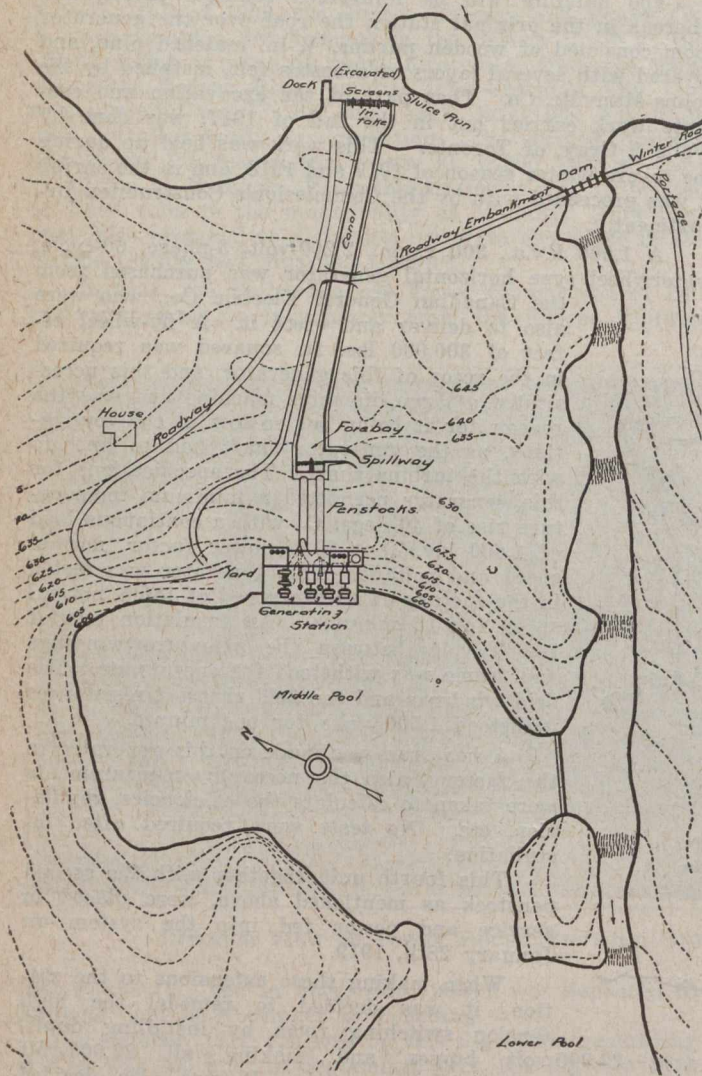
In view of the rapid increase in the power demands of the Severn System, it became necessary, early in 1917, to proceed with the extension of the Big Chute generating station.

To secure the additional capacity, a new penstock and a fourth turbine were required, together with two new valves, head gates and the necessary power-house sub-structure and superstructure.

The Dominion Bridge Co., of Montreal, secured the contract for the steel penstock, which is 9 ft. in diameter and about 170 ft. long. A contract was placed with the Wellman-Seaver-Morgan Co. for a double-runner spiral case turbine of 2,300 b.h.p. under a 56-ft. head, running at 300 r.p.m. The contract for two 66-in. diameter gate-valves, to-

connected in place of any other transformer during an interruption on that bank of only a few minutes.

Practically all the new equipment was purchased from the Canadian Westinghouse Co and was delivered during the summer of 1918. The work of installing this new equip-



BIG CHUTE POWER DEVELOPMENT, SEVERN RIVER

ment and remodeling and moving old equipment is now being proceeded with by the commission's construction department, and it is expected that it will be completed early this summer.

An electric hot water heater, together with a water tank and shower bath, are being installed for the use of the station operators and the maintenance men.

A subscriber desires to obtain a copy of *The Canadian Engineer* for November 12th, 1914. Anyone who has a spare copy of that issue would confer a favor by quoting a price for it. Address the Circulation Manager, 62 Church St., Toronto.

The Pittsburgh Filter Manufacturing Co., of Pittsburgh, Pa., has changed its name to the Pittsburgh Filter & Engineering Co., and an office has been established at its factory at Oil City, Pa. The company is now manufacturing heavy duty oil engines in addition to its line of water-purification apparatus.

The annual general meeting of the Canadian Good Roads Association will be held at 8.30 p.m., May 21st, at the Parliament Building, Quebec City, for the reception of the annual report and financial statement, election of directors and officers for the ensuing year, and ratification of amendments to constitution and by-laws.

COST-PLUS-FEE CONTRACT FOR BRIDGE CONSTRUCTION*

EXCELLENT competition under a cost-plus-a-fee form of contract was obtained recently at a bridge letting in Kansas City, Mo. The work called for the construction of the 23rd St. viaduct, a reinforced concrete and steel girder structure, requiring approximately 19,000 cu. yds of concrete, 900 tons of steel, 1,000 tons of reinforcing metal and 13,000 sq. yds. of pavement. The contract, prepared by Harrington, Howard & Ash, of Kansas City, consulting engineers for the bridge, provides that in case the actual cost overruns the estimated cost, the contractor loses one-half of the excess up to a maximum loss of two-thirds of his profit fee; in case the actual cost is less than the estimated cost, the contractor receives one-half of the saving. It also provides a method for correcting the contractor's estimated cost in case the quantities in the structure vary.

The following is a summary of the bids received for constructing the viaduct, including paving with wood block:—

Contractor.	Contractor's est. cost.	Profit fee asked.	Total.
A. S. Hecker Co.	\$681,000	\$50,000	\$ 731,000
Arkansas Bridge Co.	679,560	60,000	739,560
Edward B. Garretson Co. ..	681,440	61,329	742,769
Mellan-Stuart-Nelson Co. ..	695,000	50,000	745,000
Missouri Valley B. & I. Co.	686,000	67,000	753,000
Hunkin-Conkey Constr. Co. .	756,861	40,000	796,861
Koss Construction Co.	739,000	70,000	809,000
J. O. Petterson & Co.	795,000	78,000	873,000
A. Guthrie & Co.	813,300	60,000	873,300
Fraser, Brace & Co.	925,406	80,000	1,025,406
Foundation Co.	986,214	60,000	1,048,214

Extracts from the specifications and contract follows:—

Bids are to be on a "cost-plus-a-fee basis," as set forth in the contract. Each bidder shall state his estimated "cost of the work," which shall be termed contractor's estimated cost, and shall also state a fee which shall be termed contractor's profit fee, which shall be separate from and not a part of the contractor's estimated cost. The contractor's profit fee must not exceed 10 per cent. of the contractor's estimated cost.

The contractor's estimated cost shall be assumed to be based upon the approximate quantities stated in the contract. Inasmuch as the actual quantities in the finished structure may vary from these approximate quantities, each bidder must also quote unit prices for each of the various construction items as given in the form of proposal and bid herewith. These unit prices shall be applied to the differences between the approximate quantities given and the actual quantities in the completed structure. The sums so obtained shall be added to or subtracted from the contractor's estimated cost accordingly as the actual quantities are respectively greater or less than the corresponding approximate quantities, thus fixing an amount to be termed the revised contractor's estimated cost.

Modifications of Profit Fee

The contractor shall be paid in cash, in the manner hereinafter provided, the actual cost of the work plus a profit fee. If the actual cost of the work is equal to the revised contractor's estimated cost, the contractor shall be paid the contractor's profit fee in full. If the actual cost of the work is less than the revised contractor's estimated cost, the contractor shall be paid the contractor's profit fee, and in addition thereto one-half of the amount which the actual cost of the work is less than the revised contractor's estimated cost. If the actual cost of the work is more than the revised contractor's estimated cost, the contractor will be paid the contractor's profit fee less one-half of the amount which the actual cost of the work is in excess of the revised contractor's estimated cost; but in no event shall the contractor be paid less than the actual cost of the work plus one-third of the contractor's profit fee.

*From "Engineering and Contracting," Chicago.

WILL THE ENGINEER STAY PUT?*

BY M. O. LEIGHTON

Chairman, National Service Committee, Engineering Council, Washington, D.C.

WAR took the engineer by the scruff of the neck and placed him at the forefront of a political muddle. He acted as though he liked it. Now it is proper to ask what is he going to do about it?

In pre-war days, almost every one had become accustomed to see engineers dodge their political responsibilities. Somehow it had become fashionable in the engineering world to be a poor citizen. Once in a great while some engineer would break out and take part in political affairs. Then his brethren would sit around the stove and call him a "good politician." All the time, while so doing, they were thinking about a bad politician. In any case they were not giving their brother praise.

Lawyers Depend Upon Engineers

Looking back to pre-war times it will be recalled that every little while some impetuous engineering brother would set some trap by which the American Society of Some Kind of Engineers would have been drawn into politics. But the wiser heads were on the watch, the trap was never sprung, and the impetuous brother was usually sorry he spoke. At the end of the war we do not find ourselves debating whether it is proper and dignified for engineers to perform their duties in the political life of the nation. That question is irrelevant. The controlling fact is that "we are in." The question now before us is, shall we go skulking back to our old lairs or shall we stay put and, in the words of the immortal Roosevelt, "hit the line hard."

If it be our duty to build bridges, roads, cantonments and piers; if it be a patriotic privilege to devise destructive engines of war whereby this nation may succeed in its holy desire to keep men free, then it must also be the duty and privilege of engineers to put forth as patriotic efforts in guiding the nation to use that freedom wisely. In other words, the duty of engineers does not end with destruction and construction; it covers maintenance and operation.

No one would urge engineers to take part in government and to seek and hold elective offices therein if the object were merely that of holding the office. The real object is to give the government engineering brains. The need for such brains is gaining in importance along with the increase in complexity of our civilization. Time was when the lawyer was the most necessary person in the making of laws, and he is so to-day in the making of some kind of laws. But, in the making of laws which most acutely affect our present and future well-being, and which have the most profound influence on the development of our state of society, the lawyer, if he makes laws, must be instructed and prompted by the engineer. Look over the legislative program of to-day. You will see mines, highways, motor trucks, railroads, ships, arid lands, swamps, buildings, dams, generators—a great engineering exhibit. Can anyone think of any reason why the activities of the engineer in political life should be confined to giving advice and counsel to legislative committees, and then returning home and allowing the laws to be made by lawyers, farmers, journalists and business men? Sit down in any group of engineers and you will not have to wait long before you will hear caustic comments about poor laws, stupid legislators, etc. If the subject of conversation were a bad road, a weak bridge, or an unsafe dam, those men would roll up their sleeves and apply proper remedies. Did anyone ever hear of engineers employing the same processes with respect to the making of laws?

Need for Engineering Participation

There is profound need for this engineering participation, not only in the halls of congress, but in those of state legislatures and in the councils of municipalities. There should be an engineer in the president's cabinet, in governors' chairs,

and in the office of mayor. Why not? The Secretary of the Interior, for example is, in normal times, the chief of a larger number of engineers than any other individual in the United States. The engineering functions falling under that office so far outweigh all others in extent and importance that the Department of the Interior is essentially an engineering department. Why then would it not be logical to place an engineer as Secretary of the Interior? These are very practical questions. It may be hard to imagine that any engineer in active practice will put down his life work and take up the functions of a political office, but that is just what should occur. The time has come when engineers must make those sacrifices and perform their proper share of political duty. Legislatures and executive departments need an intimate mixture of human temperaments, and the engineering temperament is as important as any other.

A Menace to Liberty

There is, however, another aspect to this question. We have before us a grave menace to that liberty which engineers have done so much to preserve. One of the best ways to destroy that menace is to employ that stabilizing influence which arises out of engineering training and engineering habits of thought. This grave menace is that of loose political thinking. We call it by many names, but just now Bolshevism is the current expression. But the loose thinking which does real damage is not being done by the "Red." The most pernicious loose thinker of to-day in every community is a highly presentable man; an educated man, a man of science and of arts.

Two Kinds of Thinking

When the highly specialized man steps out of his specialty and occupies his intellect with the common affairs of life, his brains too often run amuck. So far as his science is concerned he follows the truth wheresoever it may lead. He critically examines all premises and when he reaches conclusions it may be certain that he has gone to the uttermost limit of proof and inquiry without accepting any rumor, or any report, or any interpretation, save that which can be verified by unmistakable evidence. However, when he relaxes and comes out of his cloister and partakes mentally of the things in the world at large his relaxation is apt to be fairly complete. Disregarding the fundamental principles that are his daily guide, he thinks loosely, jumps at conclusions and accepts as evidence any rumor that he may find in any newspaper, however yellow. So it is that his conclusions are radical, ill-digested, and totally unbefitting the mentality of him who brings them forth. Such are the men, some perchance occupying university chairs, who are to-day the most profound menace that we have in our midst. By virtue of their attainments and their demonstrated mental qualifications they attract a following, and that following seems not to appreciate the fact that one and the same individual may do two kinds of thinking.

We, as engineers, cannot lay claim to clean skirts. Among our own professional brethren there are those who see double when they relax from engineering considerations. This should not be so. Let the principle be established among engineers that the processes that guide and fix an engineering conclusion are the very ones that must apply in a political conclusion. Facts form the basis in each case. We seek and find and judicially interpret the facts in the one case, while in the other we are prone to accept half-truths, rumor and prejudice.

A Stabilizing Influence

Engineers, by virtue of their war conduct, are standing in an enviable place before their countrymen. It is well-nigh axiomatic that they will fulfill all worthy expectations. It will facilitate progress, however, if we accept right now as a fixed principle the idea that we must cultivate new habits of thought with respect to political matters, must sacrifice our personal and professional inclinations for the common good, and by applying the mental processes of engineering to matters of political economy, become one of the stabilizing influences by which this nation shall retain its greatness. All of which is but another way to say that the engineer, having been put, must stay put.

*From the Journal of the Engineers' Club of St. Louis.

AMERICAN CONCRETE INSTITUTE

THE PRESENT LEVEL OF PRICES*

BY S. M. WILLIAMS

President, Highway Industries Ass'n., Washington, D.C.

IN pre-war times the American Concrete Institute held its annual meeting in February, because at that season there is less activity in the concrete field and a larger attendance is possible. The February, 1918, session was postponed until June on account of the war, and was held in Atlantic City at the same time as the annual meeting of the American Society for Testing Materials. This year the Board of Direction of the institute considered it inadvisable to attempt another February meeting, and again called the meeting for June at Atlantic City, where one evening's joint session will be held with the American Society for Testing Materials. The other meetings of the institute have been arranged so as not to conflict with the meetings of the other society, and one open afternoon has been left to permit the members of the institute to attend the session of the other society at which the subject of cement will be discussed.

Special attention will be given once more to the subject of concrete ships. Last year the reports were largely on what was expected in the way of performance. This year the engineers who have specialized in concrete ships will be able to report what has actually been done. Although the armistice brought to a close many plans for the construction of concrete ships, nevertheless the development is looked upon by the Board of Direction of the institute as one of the most important in the concrete industry in the past decade and authoritative information should be of interest.

The following is the tentative program, further particulars concerning which can be obtained from Henry B. Alvord, secretary of the institute, 6 Beacon St., Boston, Mass.:

Morning session, June 27th: Report of Committee on Plain and Reinforced-Concrete Sewers, by W. W. Horner; report of Committee on Treatment of Concrete Surfaces, by J. C. Pearson; "Effect of Vibration during Placing on Strength of Concrete," by Prof. D. A. Abrams; "Investigation into the Economic Possibilities of Light Weight Aggregate in Building Construction," by A. W. Stephens; "Result of Investigation on Shear, Impact and Bond made for Concrete Ship Studies," by W. A. Slater.

Afternoon, June 27th: Papers on cement will be read at the meeting of the American Society for Testing Materials.

Evening, June 27th, Joint Session with American Society for Testing Materials: Report of A.S.T.M. Committee on Cement, by R. S. Greenman; report of A.S.T.M. Committee on Concrete and Concrete Aggregates, by Sanford E. Thompson; report of A.C.I. Committee on Fireproofing, by W. A. Hull; A.C.I. paper, "Later Fire Tests of Concrete Columns," by W. A. Hull; A.C.I. paper, "The Strainagraph and Its Application to Concrete Ships," by F. R. MacMillan; A.S.T.M. paper, "Effect of Fineness of Cement," by Prof. D. A. Abrams; A.S.T.M. paper, "Cements Producing Quick Hardening Concretes," by P. H. Bates.

Morning, June 28th: Report of Committee on Reinforced-Concrete and Building Laws, by E. J. Moore; report of Subcommittee on Regulation for Strength Tests of Floors; "Temperature Cracks in Chimneys," by J. G. Mingle; "Plasticity and Temperature Deformation in Concrete," by S. C. Hollister; report of Committee on Reinforced-Concrete Highway Bridges and Culverts, by A. B. Cohen; "Concrete Work on the Brooklyn Army Base," by A. C. Tozzer.

Afternoon, June 28th: Report of Committee on Concrete Roads and Pavements, by H. E. Breed; papers on "Fuel Oil Tanks," by H. B. Andrews (design), H. E. Walton (construction), J. C. Pearson (tests); report of Committee on Concrete Sidewalks and Floors, by J. E. Freeman; "Concrete Railroad Track," by A. C. Irwin; report of Committee on Nomenclature, by W. A. Slater.

Evening, June 28th: "Construction of Concrete Barges for New York State Canals," by S. C. Hollister; "Layout and Equipment of the Government Concrete Shipyards," by A. L. Bush; "Problems in the Design of Concrete Ships," by J. Glaetli, Jr.; "Problems in the Construction of Concrete Ships," by R. J. Wig.

MUCH has been said regarding the present situation of public work and especially of road building. I would not attempt to argue for unreasonable prices because unreasonable prices cannot be maintained. I have even gone so far as to say definitely to the producers of road building materials that if they are not in a position to justify their prices and reductions are coming, they should be made immediately.

If war permitted an unusual profit in any commodity that margin of profit cannot and should not be continued, but if products only brought during the war a reasonable margin of profit, and in order to maintain that profit present prices must be continued, it is the duty of you men to uphold them.

Suspicion of Prices

Unfortunately, there is a very marked degree of suspicion in the minds of the public. One industry is awaiting the action of the other with the result we are rapidly approaching a condition which, if not changed quickly, will result seriously. We should realize that industrial victories, like military victories, are won by courage, patriotism, unity and confidence.

I would remind you that we were five years reaching the present basis of prices and we cannot return to former prices and conditions in a few months. I doubt if we want to go back even if it were possible.

I would also remind you that during the last year there was very little, if any, money made by the producers and manufacturers of road building materials.

Brick Prices for Example

Unfortunately, I did not have the privilege of hearing the speech of Governor Cox from Ohio, but read it last night, and while no man in Ohio stands higher in my estimation than Governor Cox, I am afraid that he is working under a misapprehension or from wrong information in regard to road material prices. He referred to the increase in prices of various materials, one of which was brick. I was informed by one of the large producers of brick in Ohio over the phone last evening, that in November, 1917, his contract prices were \$20 per thousand delivered, to which was to be added any increase for labor, fuel and freight. In June, 1918, for deliveries upon the same contracts his price was \$25 per thousand and he assumed whatever increase there might have been in labor, fuel and freight rates. In 1919 his price is \$25, and while it is true that his fuel has been reduced slightly, his increase in the cost of labor since 1917 is considerably more than 100 per cent. and labor is more than 70 per cent. of the cost of producing brick.

Another feature surrounding the manufacture of brick is that the manufacturers have met the request of the government to keep labor employed, with the result that hundreds of thousands of brick are piled in their various yards and are not being used because of the present attitude toward public improvements. It is needless to say that the employment of this labor cannot continue very long unless there is a different attitude on the part of those responsible for public work.

Cement Prices

I am also afraid Governor Cox's information in regard to the increase on cement was unreliable inasmuch as I am informed from reliable sources that the price of cement at the mills supplying Ohio is 15c. per barrel higher than it was one year ago, and no higher than ten months ago. During this period of ten months there was one raise in freight rates upon incoming commodities and two wage increases.

I do not believe the road material industries are less patriotic than any other class of people and, notwithstanding the fact that many of their industries were practically closed dur-

*Address before conference of governors and mayors at Washington, D.C., March 5th, 1919.

ing the war, they were loyal to every call upon them and to-day stand ready to meet every obligation to their government.

Commodity Prices

Recently I read the following statement from the Cotton Publicity Committee: "The southern farmer has learned that his labor is worth more than four pounds of salt meat, a peck of meal and two or three yams every week—and perhaps a few clothes and a pair of shoes once a year. The southern boy and girl will not live on the farm any longer unless it offers more comforts. The southern people are done with shacks and cabins for homes and streaks of mud for roads. They want houses, well-paved roads, good schools and better opportunities for their children. The southern farmer is going to get a fair price for his labor. Cotton will never go back to starvation prices." Notwithstanding that statement I am reliably informed that the cotton growers are now demanding and waiting for a reduction in the cost of fertilizer; and so it goes.

Farm Products Buy More

A different attitude was shown by a prominent farmer in reference to road building. He said: "The farmer to-day can buy more roads with his products than he could a few years ago under former price conditions, and while the cost of road building has gone up, the price which the farmer receives for his products has registered a much higher advance, so that 100 lbs. of milk, or a bushel of grain, will buy more road to-day than it would in 1914."

Recently it was recommended by Lieut.-Governor Oglesby, of Illinois, that the government pocket the loss on wheat and pork and allow the farmer to go back to normal conditions. What did he mean by "normal conditions?" Does he intend to go back to conditions prior to the war, when thousands of men were leaving the farms because of unattractive and unsatisfactory labor conditions, or does he mean to allow the farm laborer a living wage, and if he allows that, will he be able to reduce the cost of living for the labor entering into manufacture and production of materials for road construction?

Labor Cost

When you consider that at least seventy-five per cent. of the cost of road construction, from the raw materials to the finished road, is labor, I do not see where we can expect much reduction in road building so long as the wages and the cost of living remain where they are. You can have roads at lower cost, but not without disturbing labor conditions.

Views of Eminent Economist

I desire to quote from a recent statement by a well-known authority, Irving Fisher, professor of Political Economy of Yale University. Mr. Fisher says:—

"At the present time there is a marked halt in production. Industry is slowing down. Unemployment of labor increases. Some industrial concerns are failing to earn profits, and others are suffering the dissipation of their accrued profits because even by shutting their plants down they cannot save certain of their expenses or any of their fixed charges. The government's revenues, dependent as they are upon the national income, may fall short at the very time we need them most. In brief, we are threatened with a widespread business depression and from peculiar causes, for the unsound conditions usually preceding a widespread business depression are absent."

No Case Exceptional

"The main reason why business is not going ahead better is that most people expect prices to drop. The merchant is selling, but not buying. The manufacturer holds up the purchase of his raw materials. People quote the disparity between present prices and those prevailing 'before the war,' and decide they will not buy much until present prices get to 'normal.' This general conviction that prices are sure to drop is putting a brake upon the entire machinery of production and distribution. Readjustment waits because we keep on waiting for it. We have waited in vain for over three

months. It is interesting to observe that many manufacturers think that prices must come down, including the price of labor, but they are ready to demonstrate to you that their own prices cannot come down, nor can they pay lower wages. Almost everything they buy somehow costs twice as much as before the war, and their labor is twice as dear. They cannot pay their labor less if labor is to meet the increased cost of living. Now, as a matter of fact, when we investigate almost any individual one of the so-called 'high prices' for industrial products, we are likely to find that individually it is not high; that is, it is not high relative to the rest. Our quarrel is with the general level of prices.

Prices on New Level

"The fundamental practical question confronting business men is whether the general level of prices is going to fall. In my opinion, it is not going to fall much, if at all. We are on a permanently higher price level and the sooner the business men of the country take this view and adjust themselves to it, the sooner they will save themselves and the nation from the misfortune which will come, if we persist in our present false hope.

"The general level of prices is dependent upon the volume and rapidity of turnover of the circulating medium in relation to the business to be transacted thereby. If the number of dollars circulated by cash and cheques doubles, while the amount of goods and service exchanged thereby remain constant, prices will about double.

"The great price changes in history have come about in just this manner. The 'price revolution' of the sixteenth century came upon Europe as a result of the great influx of gold and silver from the mines of the New World. Europe was flooded with new money. More centres were used than before in effecting exchanges, and prices became 'high.' People talked then of *temporary* 'inflation,' just as they talk of it now. But it was not temporary; it was a new price level.

Not Clever to Wait

"Business men should face the facts. To talk reverently of 1913-14 prices is to speak a dead language to-day. The buyers of the country, since the armistice, have made an unexampled attack upon prices through their waiting attitude, and yet price recessions have been insignificant. The reason is that we are on a new high price level, which will be found a stubborn reality. Business men are going to find out that the clever man is not the man who waits, but the one who finds out the new price facts, and acts accordingly."

The surest way to secure a readjustment of conditions, including prices, will be to start industry going and bring it to a normal business basis as quickly as possible. It is not fair to consider to-day's prices with those of the days when business men were failing because of the general unrest throughout the country which resulted in cut-throat competition, low wages and of course low cost of materials.

The value of a citizen to a community is not increased by forcing bankruptcy upon that citizen. Low prices of materials under such conditions become high prices, and that is just what will occur in this country if the federal, state and county governmental agencies do not establish confidence in the country by a go-ahead policy in public work. If you men representing the various states and municipalities do not go ahead with your work, you cannot expect private capital to do so, and if neither proceeds, the result will be serious not only to the road building industries, but the same spirit of "hold-back" will extend to all lines of industry.

The Cost of Delay

The cost of delay in proceeding with your road building programs is, in my estimation, more serious than the increased cost of construction. The joint committee on federal aid in the construction of post roads, sixty-third congress, reported after a careful investigation that the United States was paying annually a penalty in excessive cost of rural hauling of \$504,000,000. These figures have increased considerably because commerce to be transported over our roads, combined with the opening of new roads, far exceeds the im-

provement of roads. They are also based upon horse-drawn haulage, consequently, the saving possible from motor vehicle haulage greatly increases the penalty.

One of the main arguments for the recent \$200,000,000 increase in the United States federal aid, was that it would encourage the states to go ahead immediately with their road building programs by assisting them in meeting the higher cost of construction, and to accomplish that, the original federal aid law was amended by increasing from \$10,000 to \$20,000 the cost per mile for federal aid participation.

It has been said that some manufacturers have stated that the price of materials could be reduced, but that reduction was being prevented by certain leaders of the industries. If such is the case, and there are sound reasons whereby reductions in price of road building materials may be made, they should be, and without delay, but I would remind you of a statement made during the war by Edward N. Hurley, based upon government investigation, that many of the manufacturers did not know their cost of production and that 90 per cent. had not been making any money and 5 per cent. less than \$5,000 per year.

We are sometimes too willing to cry graft and extortion. More than any other nation on earth we stand in need of good roads and thousands of miles of them.

The adjustment of prices to what may be the new normal level can be accompanied by prosperity just as great as we have had during the raising of prices, providing we keep right on doing business.

With capital and labor which has been devoted to the war turned into avenues of production for the things which are so essential to our industrial progress and economic life, the earnings of that capital and labor will develop an enormous market for shoes, clothing, food and all the other commodities made for the comfort or to meet the desires of mankind.

With consuming and purchasing power thus sustained, our farms and factories will continue to team with activity, and prosperity will abound throughout the entire land.

With capital and labor fully and profitably employed, the only price effect will be the adjustment and probable decline of speculative prices—a result that can but little affect the normal level of legitimate values.

Conclusion .

Now, I have endeavored to give you definite, tangible facts which show clearly the fundamentals of the situation. The understanding of this situation, if confined solely to this audience, can do little to aid in the solution of the immediate and pressing problem.

If the public, as a whole, can be brought to a quick realization of the facts, we can all go ahead confidently and enter the era of great prosperity which is certainly ultimately ahead of this continent.

I believe that you should be preaching these facts to your communities and should not wait for the logic of events to force the public to the correct understanding.

The House of Common's railway committee has approved of an extension of time for the construction of the Central Canada Railway, an enterprise which is now in the hands of the exchequer court. The expiring charter authorized the construction of a line from Montreal to Georgian Bay, via. Ottawa.

A number of representative organizations in Calgary have joined forces in the formation of a Good Roads Association. Mayor R. C. Marshall is the honoray president; Jas. W. Davidson, president; P. A. Wintemute vice-president; W. S. Davidson, secretary; W. F. W. Lent, treasurer. The Dominion and provincial governments will be asked to see to it that the road connecting Calgary with the National Park is put into good condition for motor traffic.

USE OF TIE-TAMPING MACHINE INCREASING

By A. W. SWAN

Canadian Ingersoll-Rand Co., Ltd., Sherbrooke, P.Q.

IT has been stated by a prominent railway official in the United States that "no tool in recent years furnished to the track forces has filled a greater void than the power-operated tie-tamper." In the few years that the pneumatic tamper has been in use, it has been adopted by over fifty railroads in the United States, and its use is increasing very rapidly, not only in the east where stone ballast is more or less standard, but in the west and middle west where gravel ballast of the kind more commonly seen in Canada is employed.

The pneumatic tie-tamper "is a mechanical pick." With its rapidity of action the tamping is bound to be more uniform than with hand labor, and results on a number of railways have proved that as a matter of fact the work is better. In crowded yards the tamping machine is of particular advantage around frogs and switches, as it is possible to reach with it places not possible to get at with the ordinary pick or bar.

The tie-tamping outfit consists of a two-tool or four-tool outfit with portable compressor, gasoline-driven. For the tool outfit, one foreman and four men are required.



TWO-TOOL TIE-TAMPING OUTFIT SHOWS 38% SAVING IN COST OF WORK

Comparing the expense with that for hand labor with the same size of gang, the saving shows in the greatly increased speed, approximately twice the work being done in the same time, which gives a considerable saving, including all expenses of gasoline used, wear and tear, etc. According to the size of gang used, and whether a two or four-tool outfit is used, the current United States figures per mile are: For hand labor with one foreman and four men, \$390; for the same gang with two-tool outfit, \$240 (actual figures). With a larger gang and increased speed, the cost per mile with the four-tool outfit is \$250 as against \$450 per mile for hand tamping at the same speed with hand labor. Experience shows that each machine will tamp about 50,000 ties per season.

The bits supplied for tamping are 18 ins. long, and are supplied in three widths according to the type of ballast, the broader bit for the looser ballast. It has been found that it is worth while to train a man specially to look after the gasoline engine and portable compressor, keeping him on that work only.

As shown above, the cost per mile is not materially different with the four-tool outfit as compared to the two-tool outfit, but the speed is practically double, with a corresponding advantage. The compressor car is self-propelling and takes the men to work under its own power. The compressor car is easily removed from the rails on cross-skids. The amount of work varies from 400 to 700 ft. per day. The speed of the car running to and from work, bearing the section gang, is fifteen miles per hour, and the car can be removed from the rails in one minute.

AMERICAN ASSOCIATION'S ANNUAL MEETING

AT Hotel La Salle, Chicago, May 12th and 13th, will be held the annual meeting of the American Association of Engineers. The tentative program schedules the first session for 9:30 a.m., Monday, May 12th, when reports of officers and committees will be presented. At 10.30 a.m. there will be a general discussion of the relation of the American Association to local and state societies, national societies, Engineering Council and the Engineering Institute of Canada. The discussion regarding the relation of the association to the Engineering Institute will be lead by Secretary Keith, of Montreal. A paper will also be read by one of the members of the association on "The Relation of Engineers to Each Other in Employment."

At 1.30 p.m., Monday, miscellaneous business will receive consideration, to be followed by a discussion and voting on amendments to the constitution. At 3 p.m., Prof. Frederic Bass, of the University of Minnesota, will read a paper entitled "How Shall the Curricula of Engineering Colleges be Modified to Meet Modern Conditions?"

"Recognition" will be the key-note of the discussion Tuesday morning. There will be papers on proper compensation of engineers,—“Ways and Means of Obtaining,” “Recognition Through Self-Improvement and Service,” “The Engineer in Politics,” “How Far Will A.A.E. Go Into Politics?” and “Action on Behalf of the Engineers in Public Service.”

Employment and opportunities will receive attention Tuesday afternoon. The discussion will be opened by papers on “How to Make the Employment Department More Valuable” and “New Fields and Opportunities for Engineers.”

There will be a half hour's business session before dinner Tuesday, at which the judges of election will make their report and the new officers will be installed. Among the after-dinner speeches will be, “Fitting the Engineer to His Job,” by Walter Dill Scott; “Winding Up the Old Year,” by W. H. Finley; and “What We See in Front of Us,” by F. H. Newell.

CANADIAN ASSOCIATION OF BRITISH MANUFACTURERS

SEVERAL hundred Canadian representatives and branches of English and Scotch firms are forming an organization called the Canadian Association of British Manufacturers, with branches at Toronto and Montreal. Similar associations have existed for several years in Australia and New Zealand. The objects of the association as set forth in its constitution are as follows:—“To further the interests of British trade throughout the Dominion of Canada and to affiliate with and work in concert with kindred associations in other centres of the Dominion having similar objects.”

Those interested in the formation of the association naturally wish to increase Great Britain's share of the import trade of Canada. As Canada is buying a considerable volume of merchandise abroad each year, it is desired that the United Kingdom shall obtain a substantial share of that business. It is felt that the progress which Canadian manufacturers have made, especially during the past few years, will be exceeded by the manufacturing developments in Canada in the future. This is recognized as a welcome and gratifying feature, because as each unit of the British Empire becomes stronger industrially and agriculturally, each developing its resources, so will the empire grow in stability, prosperity and influence.

The association is governed by a supreme council and each branch will have its own executive council. The supreme council will consist of the chairman and one councillor from each local executive. The association will consist of British subjects only:—

(a) British manufacturers and wholesale exporters from the United Kingdom;

(b) Representatives and agents of British manufacturers and wholesale exporters from the United Kingdom.

No representative or agent of British manufacturers who enters into any agency agreement with, or in any way represents any manufacturers or wholesale exporters whose principal works or place of business are situated in any country deemed by the supreme council to be or to have been hostile or unfriendly, will be entitled to membership in the association.

Assistance in the formation of the association has been rendered by G. T. Milne and F. W. Field, the British Government Trade Commissioners in Canada.

EXPIRATION OF NORCROSS FLAT-SLAB PATENT*

ON April 29th, 1919, the famous Norcross patent, U. S. No. 698,542, on reinforced-concrete flat-slab floors expired, and with it, according to the present legal status of the case, went the right of the Flat Slab Patents Co., the owner of the patent, to charge a royalty or to issue a license for the construction and use of a flat-slab floor. This right had been generally recognized since the 1918 decision in the Lauter Piano case, and by many admitted since the 1914 Drum vs. Turner decision. It had been so recognized, however, not because engineers believed those decisions to be just or reasonable, but because it became evident that the complicated legal patent procedure had firmly established the Norcross patent as the basic patent on flat slabs and that it would be futile to try to override the precedent of two original Circuit Court decisions, with several confirmatory later decisions.

It is not the intention of this journal now to enter into a discussion of the evidence and procedure which marked the various Turner-Norcross patent cases. The printed record of those cases occupies many volumes, and only one who was forced to do so would attempt to wade through it. Certainly, the various engineering experts on both sides, whether intentionally or not, succeeded in obscuring the real issue and in confusing the judges as to the technical questions involved. It is of interest, though, to note that the two cases are founded on diametrically opposite principles. According to the Drum-Turner decision, Norcross showed invention in his novel arrangement of steel in a flat-slab floor, although obviously flat-slab floors had been previously patented and built. The later Lauter decision held that Turner's patent infringes Norcross' because its difference in placing reinforcement does not constitute invention. In other words, the first case sets up Norcross as a basic patentee on analogous grounds to which the second case denies invention to Turner. To confuse matters, in a later decision the Drum-Turner court specifically stated that it considered the Norcross invention to lie in a floor without supporting beams, not merely in the location of the reinforcing rods.

In practically all of the other reinforced concrete patent cases there has been a growing movement toward consistent thought. Arrangement of reinforcement to meet stresses is now fairly definitely established as mere engineering design and not invention. On such a basis neither Turner nor Norcross was entitled to a patent, because both developed through ready processes of engineering thought a type of structure established by record if not by extensive practice. A flat reinforced-concrete slab, supported on four columns, antedated both patents. Whether the designers and builders of these earlier slabs understood the actions that took place in the structure or designed correctly to meet those actions, is not pertinent if there was sufficient suggestion in them to permit an engineer skilled in structural design to adapt the principle to meet acceptable theory.

The progress of the litigation and the subsequent success of the Norcross patent, with its levying a tax on hundreds of structures, was a legal victory entirely and not an engineering one. No one doubts that Turner developed a commercial flat-slab floor, though few agree with his highly optimistic views on the strength of his floors. On the

*Editorial in “Engineering News-Record,” New York.

other hand, the Norcross case bore every evidence of lying only in a paper patent put forward to fight Turner's claims for invention and his prospective, if not actual, demands for royalty. Neither patent, in the views of most engineers to-day, was anything but a step forward in design, and the enforcement of a tax to be paid to either one of the patentees on the ground that his was a broad basic patent was bound to be resented as a legal imposition, although unfortunately there was no redress when once the courts had made their decision.

OTTAWA CONTRACTORS ORGANIZE

SPEAKING last month, at the organization meeting of the Association of Ottawa Building and Construction Industries, J. P. Anglin, of Montreal, declared that since 1913, building costs, including supplies and labor, have only increased 57%, which is, relatively speaking, the lowest increase of any of the industries. Statistics show that farm produce had increased 123%, clothing 152%, drugs 104% and house furnishings 133%.

In outlining the importance of an organization for contractors, Mr. Anglin stated that the building fraternity would eventually "put themselves and their industries in Canada on the map." In the past years, contractors have never been consulted by the government on matters dealing with reconstruction and other important problems, and he believes that strong organization is the only means by which the fraternity will be able to command recognition. He voiced his approval of a standard form of contract, which would provide for labor troubles and arbitration clause. "If Canada is to go ahead in the next few years, we have all got to work together for a maximum amount of production in all lines," he stated. "As it is now, we are only getting about 25% efficiency, where it should at the least be 50%. We pay the men the wages they demand, but to increase our efficiency there must be some other incentive. Get your men to understand and take an interest in your business, and it will aid as a solution in solving the reconstruction problem."

Preliminary steps were taken by the contractors at the meeting to cope with the troubles that arose with the building unions on May 1st, and which had been anticipated by many of the Ottawa contractors. A representative from each class of contractors and supply dealers was appointed on an executive committee which interviewed the Minister of Labor on the labor question and which appointed a council to meet representatives of organized labor.

A. S. Clarson, general secretary of the Association of Canadian Building and Construction Industries, was also present, and gave a very clear insight into the reconstruction problem and the aims of the organization. "The contracting fraternity," stated Mr. Clarson, "is just like a great big democracy which was poorly organized in Canada. Without efficient public and private education, the corporation of contractors would easily wander into Bolshevism of industry. A primary duty of reconstruction, as we are viewing it, is not only a better understanding between all builders and contractors, but towards better education. To this end we should have a representative sitting on every government commission that may be appointed which has to do with repatriation, reconstruction, immigration, or any other progressive movement that may arise along the lines of conservation of energy and ability. Public opening of tenders is another aim. We are determined that our Canadian goods will be used wherever possible. With all respect to our American friends, we should not buy building material from United States, when our own manufacturers can supply as good if not better material."

Mr. Clarson stated that labor matters would be fairly dealt with by the association, and that the association expects to have the co-operation of Tom Moore, president of the Trades and Labor Congress. "Let there be no dishonoring of the draft of devotion which our soldiers have made," stated Mr. Clarson. "Let no spirits arise that will suggest Bolshevism, which is just Czarism in overalls."

J. T. Blyth spoke on the labor problem and stated that it was going to be impossible for any contractor to exploit labor or make money out of labor. "Labor is so strong," asserted Mr. Blyth, "that at the present time, the only way to deal with the proposition is on a business basis. It is up to the building trades to organize on a basis where we can meet organized labor and arrange terms where the working man shall have something more than a bare living wage."

Charles Hopewell presided at the meeting and said that with earnest co-operation there was no doubt that the organization in Ottawa would be a pronounced success. A vote of thanks was extended to Mr. Anglin and Mr. Clarson for their assistance in forming the new local organization.

PUBLICATIONS RECEIVED

JEFFREY TYPE-A SHREDDER.—Catalogue No. 245, published by the Jeffrey Manufacturing Co., Montreal, 28 pages and cover, 6 x 7 ins., two colors, coated paper, well illustrated. Describes swing-hammer shredder for paper mills, tanneries, turpentine works and extracting works.

SCOOP CONVEYOR.—"Over One Thousand Scoop Conveyors" is the title of a 20-page folder published by the Portable Machinery Co., Passaic, N.J. Printed in two colors on coated paper and well illustrated with views showing the various uses of the conveyor in storing, reclaiming, loading and unloading material such as coal, coke, ashes, sand, gravel, crushed stone, cement, chemicals, etc. Thirty-two letters from users testify to the merits of the conveyor.

HEAVY DUTY OIL ENGINES.—Bulletin O.E. 20, published by the Pittsburgh Filter & Engineering Co., Oil City, Pa., 20 pages, 6½ x 9 ins., illustrated. Describes a new type of marine oil engine, embodying the Brons or Hvid principle. The motor has no carburetor, hot bulb or plate, spark plug, high pressure air-compressor, fuel pump or spray valve. The motor is started cold and is put under full load within a few seconds. The motor uses any kind of oil from kerosene to the heaviest of fuel oil. The same fuel that is used for operation is used for starting.

COST-PLUS-FEE CONTRACT FOR BRIDGE CONSTRUCTION

(Continued from page 439)

certified off by the engineers. Immediate disposition shall be made of any such items certified off at times prior to the end of the work by sale or otherwise, as may be directed. Tools or other elements so destroyed, lost or missing from the work as to make impracticable the presentation of broken parts, should be accounted for by suitable affidavit made at the time of such destruction.

Payments

On or about the first day of the month the contractor shall prepare a statement showing the amounts which he has expended for labor and materials, including the rentals of the plant during the previous month (which had been previously ordered and approved by the engineers); such statement shall be accompanied by signed pay rolls and receipted bills, or other evidence that payments have been made for all of the expenditures represented. The engineers shall verify such statement and, if found correct, shall render estimates to the city covering the total amount of such statements, or so much thereof as may be found correct. Payments in cash, in the manner hereinafter provided, will be made upon the engineers' estimates about fifteen days after they are rendered. The engineers' decisions shall govern as to what items shall be and what shall not be included in the estimate under the cost of the work as provided herein. The estimate shall show the total gross amount of expenditures to date, the expenditures for the month past, and the previously allowed payments. The total amount of the estimate, less previous payments, shall be paid to the contractor in cash.

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JAMES J. SALMOND
President and General Manager

ALBERT E. JENNINGS
Assistant General Manager

HEAD OFFICE: 62 CHURCH STREET, TORONTO, ONT.
Telephone, Main 7404. Cable Address, "Engineer, Toronto."

Western Canada Office: 1206 McArthur Bldg., Winnipeg. G. W. GOODALL, Mgr.

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CHLORINE TREATMENT A BOON, NOT A MENACE

IN the March issue of *Conservation*, the official publication of the Commission of Conservation, Ottawa, there is an anonymous article that carries the following heading: "Chlorine Treatment Temporary Measure. Defects in the System Render it a Constant Danger to Public Health."

The article refers to water-sterilization as a temporary measure, claims that "expert opinion" has asserted that the chlorination of a contaminated water supply should never be adopted as a permanent policy, and urges that every community should earnestly endeavor to obtain a pure water supply either "directly" or by means of filtration.

Up-to-date sanitary engineering theories are not in accord with *Conservation's* theory that chlorination is merely a temporary measure and that it can be entirely supplanted by filtration. As has been pointed out by the chlorinating companies themselves, filters are unquestionably the first line of defence; and on the other hand, the filter-manufacturing companies welcome sterilization as a valuable and permanent ally in the purification of water supplies.

No manufacturer of filter plants can guarantee 100% bacterial efficiency. Under certain conditions he will guarantee to remove possibly from 94 to 98% of the bacteria in the raw water, but for the remainder of the work of obtaining absolutely sterile water, one must resort to sterilization of some kind. Dirty water cannot be so successfully chlorinated as clean water; chlorine will not kill all the germs in a polluted supply unless the water be filtered before chlorination. Sterilization will not supplant filtration, but sterilization picks up the work where filtration leaves off, and the two go hand in hand.

A combination of filtration and sterilization is the one really safe way of obtaining a pure water supply in populated districts unless a city or town be peculiarly well situated in regard to artesian wells of unimpeachable character.

The character of many wells is not unimpeachable; the water they yield sometimes needs filtration and sterilization as urgently as do some surface supplies.

Another aspect of sterilization as a permanent aid to filtration, is the economic one. It is sometimes very much cheaper to operate a filtration plant, at, say, 92% efficiency than at 98%, and the former efficiency may be sufficiently satisfactory to permit some sterilizing process to kill all of the remaining pathogenic bacteria.

The above-mentioned article in *Conservation* speaks of "the inherent defects" of chlorination coming to light in the United States. Just two instances are cited by *Conservation* as proving these defects,—one at Milwaukee, Wisconsin, and the other at Xenia, Ohio. At Milwaukee so many citizens complained that they could taste chlorine in the water, that an employe at the pumping station took it upon himself to eliminate the chlorine treatment for a 12-hour period. Surely that is not an inherent defect in chlorination! What would happen if a filtration plant operator were to by-pass his raw water and cut out the beds for twelve hours? No sanitary system is foolproof. Any method of purification of water supplies is likely to show "inherent defects" if its operation be left to an ivory-headed idiot.

"At Xenia," says *Conservation*, "a small typhoid epidemic was started recently owing to the inferior quality of the chlorine powder used in the water supply." That is quite true, but it shows no inherent defect in chlorination as now practiced among all up-to-date municipalities. Note the words "chlorine powder." Ordinary bleaching powder, or hypochlorite decreases in strength from day to day. Its chlorine content can never be known without analysis. It is admittedly unreliable in the hands of an operator of a small plant such as one would find at Xenia, an operator who must "carry on" without the aids of daily laboratory tests and expert advice. This defect, however, is totally eliminated by the use of liquid chlorine, which is always of constant purity and quality and which can safely be left in the care of any operator of average intelligence who appreciates the responsibility of his position.

In a recent issue of *Conservation*, L. G. Denis, a member of the technical staff of the Commission of Conservation, pointed out that all attendants of water filtration or sewage treatment plants should be licensed. "These operators," says Mr. Denis, "have in their hands the lives of the population served practically to the same degree as a locomotive driver and more so than a boiler stoker. Why not have them also licensed?" Such a system of licensing no doubt would obviate incidents such as experienced at Milwaukee, as the examination that the operator would be required to pass could be made sufficiently drastic to impress the man with a sense of his responsibilities. The examination would also tend to reveal the mental deficiencies of an operator who would permit polluted water to enter a city's mains because some imaginative citizens "tasted" chlorine.

The tasting of chlorine in water is the favorite indoor sport of all towns where chlorination is an innovation. Innumerable and amusing anecdotes are related in this connection. In one eastern Ontario town, the chlorinating apparatus had arrived and was installed in the pumping station. Word to this effect spread through the town and the people presumed that the water was being chlorinated. Immediately a deluge of protests was received at the town hall. Scores of telephone calls insisted that the water was simply undrinkable on account of the chlorine. As a matter of fact, the drums containing the chlorine gas had not yet arrived and not an ounce of chemical of any kind was passing through the apparatus.

In another well-known municipality, when chlorination was first started there was similar complaint. The municipality's engineer effectually silenced much of this criticism to the satisfaction of the other city officials by inviting a considerable number of complainants to meet him at the pumping station. Upon a table he placed a large number of glasses of water, each glass labeled and numbered. Some of the glasses contained water that had been chlorinated, and some contained water taken from the main before chlorination. The engineer invited the various complainants

to drink any of the glasses of water and to call out the numbers of the glasses in which they could taste chlorine. There were different amounts of chlorine in the various glasses, he said diplomatically. He then handed to the mayor a certified list showing the numbers of the glasses that contained the chlorinated water. Nearly every man who claimed that he could taste chlorine, had picked a glass of water that had not been chlorinated.

Such incidents are amusing, but the attack upon chlorination that has been published by *Conservation* is more serious and unfortunate. *Conservation* says that chlorination is a menace to health. We say that chlorination is a boon to humanity. Within the past few years it has saved thousands of lives, many more thousands of cases of illness from typhoid and other water-borne diseases, and millions of dollars. It is not at any time a substitute for filtration, but it is at all times a valuable aid and adjunct to filtration. Chlorination has proven its case; *Conservation* has not.

In conclusion, it is only fair to *Conservation* to state that its "warning" regarding chlorination was well intentioned. *Conservation* has no axes to grind and has no reason to be inimical to any process excepting from a belief that the public health is concerned. The Commission of *Conservation* has the interests of the public truly at heart. What caused its attack upon chlorination, no doubt, was the tendency of many towns to think that they are doing enough in the interests of a pure water supply if they chlorinate the water, when as a matter of fact they need both filtration and chlorination. *Conservation's* intentions were good; municipalities should be warned of the need for filtration in addition to chlorination; but there was no need to decry the merits of chlorination in giving such warning.

PERSONALS

E. DRINKWATER, consulting engineer, has moved his office from Montreal South to 180 St. James St., Montreal.

G. C. MCDOWELL, formerly town engineer of Truro, N.S., has been appointed city engineer of Fredericton, N.B.

H. M. MILLER, superintendent of the Waterton (Ont.) Light and Heat Board, has accepted a position as "Hydro" engineer at Carleton Place, Ont., in connection with the "Hydro" extension there.

MAJOR DOUGLAS H. NELLES, of Ottawa, has returned home and will rejoin the geodetic survey. Major Nelles has been in France for two years as O.C. of the 19th Co., Canadian Forestry Corps.

IVAN E. VALLEE has been appointed chief engineer and director of railways, Department of Public Works, Province of Quebec. Mr. Vallee will act as engineer of the Quebec Public Utilities Commission.

MAJOR A. M. JACKSON, of Brantford, has been appointed engineer of Brant county, Ontario. Before enlistment, Maj. Jackson was in private practice at Brantford. He returned recently from overseas.

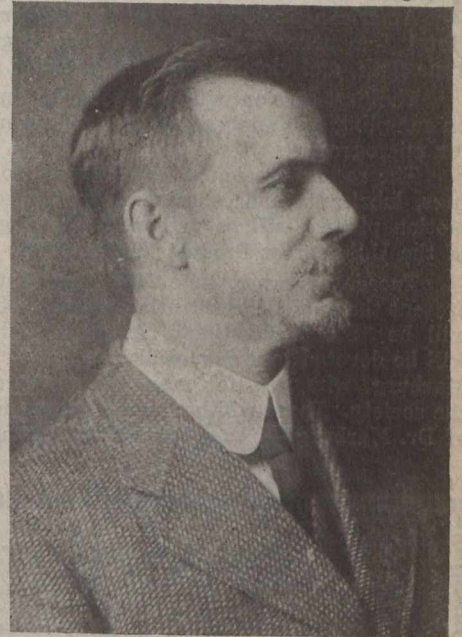
JOHN C. MACLENNAN, professor of physics at the University of Toronto, who for the past two years has been in England as special scientific adviser to the British Admiralty, has returned to Toronto.

LT.-COL. C. H. MITCHELL, who recently accepted appointment as dean of the Faculty of Applied Science, University of Toronto, has been promoted in military rank and is now Brigadier-General Mitchell.

A. S. CLARSON, general secretary of the Canadian Association of Building and Construction Industries, expects to make a trip covering the entire Dominion at an early date. In all of the principal cities he will organize branches in accordance with local conditions.

MAJOR JOHN LEY RETALLACK has been appointed public utilities commissioner for British Columbia. Major Retallack served five years with the Royal North West Mounted Police, and after his discharge in 1889 settled in the Kootenay district. He has had experience in railway construction, banking, mining and corporation accounting. He was at Ypres and the Somme.

WALTER JOSEPH FRANCIS, who was recently elected one of the vice-presidents of the Engineering Institute of Canada, was born January 28th, 1872, at Toronto and was educated at Toronto Collegiate Institute and the University of Toronto, where he graduated with honors in civil engineering with the class of 1893. During the summers of his years at the university, Mr. Francis was inspector and draftsman on the construction of the Toronto Belt Line Railway. Upon graduation he became topographer on the Nipissing and James Bay Railway location. A few months later he was appointed assistant engineer on the design and construction of the Toronto Union Station. In 1896 Mr. Francis became chief draftsman of the Central Bridge and Engineering Co. at Peterborough and two years later entered the service of the Department of Railways and Canals of Canada. He spent eight years in that department during which time he designed and had charge of the construction of two hydraulic lift locks on the Trent canal, and was also division engineer in charge of ten miles of canal construction. In 1906 he was employed by the firm of Ross & Holgate, consulting engineers, Montreal, as engineer in charge of the construction of hydro-electric works in British Columbia. The following year Mr. Francis became assistant



manager and chief engineer of the Dominion Engineering & Construction Co., Montreal, and in 1908 entered private practice, his firm subsequently becoming incorporated as Walter J. Francis & Co., Ltd., including F. B. Brown, whom Mr. Francis took into partnership in 1910. During the past ten years, Mr. Francis has been Canadian correspondent for the "Engineer" of London, Eng., and has appeared as expert engineering witness in a large number of legal disputes. As consulting engineer Mr. Francis has reported on a considerable number of hydro-electric power propositions in various parts of Canada. He reconstructed the Campbellford plant and designed two plants for the Dorchester Electric Co. He reported on the public utilities of Edmonton, on the Don syphon for the main intercepting sewers of the city of Toronto, on water supply for the city of Moose Jaw (which he subsequently designed and constructed at a cost of over \$500,000), on water supply for the city of Winnipeg, on troubles between the city and the contractor in connection with the Montreal filtration plant, on sewer tunneling and underground electrical distribution for Edmonton, on roads and waterworks for Pointe Claire, P.Q., on the construction of the Quinze dam for the Department of Public Works, and on many other civil and electrical problems in various parts of the Dominion. In 1910, Mr. Francis represented the Canadian Society of Civil Engineers on the committee appointed by the city of Montreal to revise the building by-laws and was later appointed chairman of the sub-committee in charge of the drafting of the new by-laws. In 1913, he was chairman of the committee of the Canadian Society of Civil Engineers that prepared standard specifications for concrete and reinforced concrete. He is a member of the Institution of Civil Engineers and the Engineering Institute of Canada, and has been a councillor of the Institute almost continuously since 1910.

OBITUARY

DANIEL B. DETWEILER, of Kitchener, Ont., died last month after six months' illness. Mr. Detweiler was president of the Algoma Power Co., and one of the pioneers of the Hydro-Electric Power Commission's enterprise in Ontario, having been instrumental in calling the first meeting at which the Western Ontario Hydro Power Association was formed in 1902, this organization marking the beginning of what rapidly grew to the present big system.

AMERICAN SOCIETY FOR TESTING MATERIALS

THERE will be ten sessions at the annual meeting of the American Society for Testing Materials, to be held at Hotel Traymore, Atlantic City, N.J., beginning at 10 a.m., June 24th, and closing with the evening session, June 27th.

The first session will be devoted to reports of committees on sampling and analysis of coal and on magnification scales for micrographs.

The second session will be devoted to preservative coatings, lubricants and containers, in connection with which a motion picture will be presented showing certain activities of the U.S. Forest Products Laboratory.

Tuesday evening, June 24th, president G. H. Clamer will present the annual presidential address. Mr. Clamer's subject will be "Standardization." After the address, this session will be devoted to a memorial in honor of the late Dr. Edgar Marburg, who was for many years secretary-treasurer of the society. There will be five addresses on the life and work of Dr. Marburg,—“As a Teacher,” “As an Engineer,” “Early

Activities in the Society,” “Recent Activities in the Society,” and “A Personal Tribute.”

The fourth session will be devoted to steel and wrought iron, and Wednesday afternoon, June 25th, there will be committee meetings. That evening will be devoted to a topical discussion on “Magnestic Analysis.”

“Testing and Apparatus, Rubber and Textiles,” will be the subjects for discussion at the sixth session. Thursday afternoon, June 26th, will be devoted to a golf tournament, and that evening there will be reports of committees on malleable iron and non-ferrous metals.

There will be three sessions Friday, June 27th, the last day of the meeting, the day sessions being devoted to ceramics, lime and road materials, concrete and gypsum, while the tenth and last session, Friday evening, will be a joint meeting with the American Concrete Institute to discuss cement and concrete.

UNDERDRAINAGE FOR WINNIPEG AQUEDUCT

FOUR Winnipeg engineers, J. G. Sullivan, W. P. Brereton, John Woodman and J. C. Holden, have been asked by the Greater Winnipeg Water District Commissioners to consult with the chief engineer of the district, W. G. Chace, regarding the necessity of spending about \$150,000 for an under-drainage system for one portion of the Shoal Lake aqueduct. Mr. Chace stated that tests of the soil along the aqueduct had shown one bad spot about 17 miles from Winnipeg, and he recommended that drainage work be done in order to prevent the action of alkali upon the concrete. He said that it would be practically no more expensive to do this work now than if it had been arranged for at the time the contract for that section of the aqueduct was let.

CONSTRUCTION NEWS SECTION

Readers will confer a great favor by sending in news items from time to time. We are particularly eager to get notes regarding engineering work in hand or proposed, contracts awarded, changes in staffs, etc.

ADDITIONAL TENDERS PENDING

Not Including Those Reported in This Issue

Further information may be had from the issues of *The Canadian Engineer*, to which reference is made.

PLACE OF WORK	TENDERS CLOSE	ISSUE OF	PAGE
Brampton, Ont., pavements	May 12.	May 1.	432
Bright, Ont., bridge	May 12.	May 1.	432
Charlottetown, P.E.I., power house and laundry	May 13.	May 1.	44
Comox, B.C., lighthouse	May 12.	May 1.	48
Deseronto, Ont., school	May 28.	May 1.	46
Fort William, Ont., schools	May 9.	May 1.	46
Guelph, Ont., dormitory	May 14.	May 1.	46
Lotbiniere, Que., bridge	May 12.	Apr. 24.	414
Merritt, B.C., nurses' home	May 12.	May 1.	46
Mimico, Ont., pavements	May 17.	May 1.	432
Norquay, Sask., school	May 15.	Apr. 24.	44
North Battleford, Sask., hospital	May 14.	May 1.	48
North Temiskaming, Que., bridge	May 13.	Apr. 24.	414
Sherbrooke, Que., pavements	May 12.	Apr. 24.	41
Sherbrooke, Que., buildings	May 10.	May 1.	48
Stockholms, Sask., church	May 10.	May 1.	48
St. Catharines, Ont., pavements	May 14.	May 1.	43
St. Severe, Que., roads	June 2.	Apr. 10.	42
Toronto, Ont., laundry	May 9.	May 1.	48
Toronto, Ont., school	May 30.	May 1.	48

BRIDGES, ROADS AND STREETS

Arnprior, Ont.—The County Council has decided to construct and improve various roads.

Arthur, Ont.—Tenders will be received by E. Gainer, clerk of Peel Township, up to May 20th, for construction of bridge and abutments. Official advertisement on another page of this issue.

Arthur, Ont.—Tenders will be received by the undersigned until May 13th, for construction of five concrete bridges in the County of Wellington. J. M. Kearns, Reeve. Engineers, Bowman & Connor, 31 Queen St. W., Toronto. Official advertisement on another page of this issue.

Aurora, Ont.—Macadam pavements will be constructed on Yonge St.

Banff, B.C.—With the passage of the bill granting to the Dominion government the park reserve in the Banff-Windermere country, it will be necessary to improve the roads into the Columbia district in order that they may be able to carry the automobile traffic which will develop when the Banff-Windermere road has been constructed. Hon. J. H. King, Minister of Public Works.

Banff, B.C.—Work has started on improvements to the Calgary-Banff highway, and material is on the ground for replacing ten or twelve bridges.

Bowmanville, Ont.—Tenders will be received by the undersigned until noon, May 28th, for the construction of concrete abutments, concrete pedestals, floor, grading and other work necessary in the building of a bridge on the Provincial Highway over Bowmanville Brook. Plans,